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ABSTRACT

A study investigated the relative effects of using computers and writing by hand on secondary students' quality or quantity of writing, and on their attitudes toward writing. Subjects were 40 eighth-grade students in an Anglo-Chinese school in Hong Kong, with some experience in writing brief compositions. The word processing program used was PC-Write, with a RAM resident 80,000-word dictionary substituted for the PC-Write dictionary. The study lasted 5 months, including a typing training session, a word-processing session, and all writing sessions. in each 80-minute writing lesson, the researcher spent 30 minutes discussing how to write an essay. A guided writing sheet was handed out, and students were divided into two groups with separate supervision, one in the computer lab and one in the regular classroom. To encourage revision, subjects could rewrite at specified times, under supervision. Essays were rated for quality by two external raters. Writing quantity was measured by the number of words written. Student attitude was assessed by questionnaire. Results show that students using computers wrote better and longer essays. All subjects showed significant changes in attitude, but neither group felt writing in English was easy or enjoyable. A 43-item bibliography, the essay rating scale, and the attitude questionnaire are appended. (MSE)

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Paper on

'Writing with pen or computer?

A study on ESL secondary school learners'

presented at

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I.Statement of the problem

Research on the effects of writing done by wordprocessors in elementary, secondary schools have been explored in monolingual countries .Some are without documentation for their assertions while some are substantiated by data , (Beesley 1986, Cheever 1987, Posey.1986, Grizinki 1986, Baer,1986). However, such experiments have not yet been investigated in setting where English is used as a second language. Therefore the impact of word processing on the teaching of writing of ESL is so far untested and their effects are yet to be known. As the results of Hong Kong students' writings are reportedly not satisfactory, this study attempts to examine how word-processing can affect the students' writing in terms of the quality, quantity and, attitude towards writing .

II. Literature Review

With the advent of word processor, it provides the writers a tool to carry out their writing more effectively. According to Graves (1983), the current trend in the teaching of writing is towards the use of 'process writing'. The basis of this technique is that good expression and technical accuracy are developed through refining an original written draft several times, by requiring the writer to reflect on what has been written, and comparing that to the plans the writer has for the piece of writing.

It can be seen that by using word processors, learners are encouraged to edit more as word processors can provide the functions of editing, revising and publishing. As Schwartz (1982) indicates, the word processor has the following advantages:

1. It reduces the initial fear students have of making their mistakes and hence decreases writers'block.
2. Students are much more willing to fully explore what they might mean.
3. Writers are less defensive about taking advice---changes can be made instantly without tedious recopying.
4. Writers are able to read clean drafts (without erasures, over-writing, arrows etc,) which allows them to revise more efficiently and more objectively.

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With computer-based word processors, writers can easily insert, delete, their written discourse . Writers can modify their text that are difficult to do with pencil and paper. Word processing can overcome the negative connotations often associated with revision, for "the term rewriting has, even for many writers , an aura of failure about it, rewriting is too often taught as a punishment not as an opportunity for discovery or even as inevitable part of the writing process (Murray, 1978,p.85).

A. Findings of research in monolingual settings

Research on writing with computer has started at 80s. Elementary, high school, college students are tested mainly on 3 areas . They are significant differences on the no. of revisions, quality & quantity and their attitude towards writing between computer group and pen group.

(i)Studies with elementary students (Grade 1 to 6)

It is found that collaborative work at the computer created a new social organization that enhanced writers to input and arrange their screen with ease. They began to show sharing attitude as a result of using wordprocessor (Dickinson 86, Heap 86. Bruce & Rubin 83, Sheingold et al 83, Reil ,83).

Positive results on improved quality & quantity of writings more numbers of revisions and stronger motivation to write with a computer are also established (Daiute & Taylor 81, Barbar 82, Bradley 82, Monahan 82, Levin et al 83, Bean 83, Daiute 93, Kane 83, Fisher 83, Collier 83, Moran 83, Sommers & Collins 84, Womble 84, Philips 89, Heffron 86, Au & Broadley , 87, ,Cheever 87).

However, some findings did not support that wordprocessing could improve the processes or products of the students such as Nichols 84, Daiute 85, Boone 85, Wolley 85 , Beesely 86.

(ii) Studies with High school students (Grade 7 to 12)

Research indicated that word-processing enhanced more revisions, longer essays, and better qualities for high school student were Daiute 86, Stromberg, 83, Kurth 87, Baer 86, Grizinki 86.

Insignificant differences are also found among product and the no. of revisions in the studies of Fitch 85, Daiute 85, Kurth 86, Bryson ,86.

To sum up , the research findings across monolingual countries in primary and secondary schools basically support the idea that word processors serve to heighten the learner's motivation in writing process and revise their texts more effectively.

However, will the same result occur in countries where English is used as a second language ?

(iii) Studies with ESL students on computer and writing.

According to ERIC data ,3 studies have been done (Benesh 1987, Johnson 1986, Brisk 1986) but none of it is related to secondary school ESL students.

III.Background and procedures

A. Aim of the study-The objectives of this study were to investigate if there were any significant differences between the subjects who used computer and subjects who used pen in writing in terms of quality , quantity and attitude towards writing .

B. Subjects -A F.2 (Grade 8) class of 40 students was chosen from a subsidized Anglo-Chinese school which occupies the majority of the total no of schools in Hong Kong. F.2 was selected because this group of ESL had some experience in writing their compositions at sentence level (in 80 to 100 words). Another reason for choosing F.2 was that it was better to correct their attitude towards writing at an early age.

C. Software

1.PC-WRITE-It is a shared ware, easy to learn word processing program. Though most research adopted IBM Bank Street Writer, most researchers (Beesley 86, Posey 86, Grizinki 86) shared the same feeling that there are too major limitations. The first was that the text-generating features and text-editing features are accessed in two separate modes whcih is quite inconvenient . The second was that the screen could only display 40-column where the writer can see a limited amount of material.

In view of these limitations , it might affect the results of the study so PC WRITE is chosen for it is sophisticated but easy-to pick- up by F.2 students.

2.Turbo Lightning-It is a RAM resident dictionary with 80,000 words. It performs the look-up functions faster than PC-Write dictionary and also the storage of words is bigger than PC-WRITE. Beeping is also installed for alerting wrong spelling.

D.Hardware - 11 one-drive Commodore PCs with 640K ram and 2 NX-10 printers were used in the air-conditioned laboratory . Without using IBM compatible PC, the easy-to-use word processor PC-WRITE and the big memory speller checker 'Turbo Lightning ' could not run.

To save the troubles of inserting 4 disks (Dos, Turbo Lightning, PC-Write, Data),the subjects only had to insert 2 disks. They were:

1. Dos + Turbo Lightning,
2. Pc-Write +Recording Program +Data Disk

E.Duration

The duration of this study lasted for 5 months including typing training session, wordprocessing session and the sessions of writing .

F.Procedures

Since the regular writing lessons were done in alternate week, the exposure to writing was limited. In order to remedy this, supplementary lessons were held after school as part of the writing curriculum. Altogether 10 sessions were held.

In each 80-minute writing lesson, the reseracher spent 30 minutes on discussing how to write the essay with the class. A guided writing sheet was given. After discussion , the class was randomly divided into two groups. The control group remained in their classroom which was supervised by their English teacher while the experimental group was supervised by the researcher in the Computer Lab.

In order to encourage more revisions, computer subjects could write again in the computer laboratory under the supervision of the student helpers at the specified lunch and after school hours.

Pen subjects could also write more drafts and hand in at a specified date ,similar to the computer group.

IV.Hypothesis

There were three hypotheses to be tested.

1.Subjects using word processor have no significant difference with subjects using pen in terms of quality .
2.Students using word processor can write longer essays than students who use pens.
3.No significant difference is found in students' attitude toward writing before and after the experiment .

V. Analysis

A.Quality

To test hypothesis 1 ,two Grade 8 holistic raters who were not the school teachers of that school were invited to mark the essays . One teacher had 8 years teaching experience while the other one had 4 years.

A training session was held to acquaint the raters with the characteristics to be taken into account when judging the students' papers holistically. They were asked to concentrate on content , organization, and communication. Since other measures related to spelling punctuation ,and grammar would be calculated in other area, the raters were told to take mechanics into account only so far as errors blocked communication or were so excessive they irritated the raters.

The quality of each composition was to be rated on a five-point scale, with one representing the lowest and five the highest .

Table 1 goes here
(see Appendix 1)

Detailed explanations and compositions exemplifying each level of the rating scale were presented and discussed effectively; there was no underlying theme or plot, and the piece was difficult to understand. 2 meant the writing was unorganized and hard to follow, and ideas were stated but not explained. A story would receive a rating of 3 if it conveyed a theme or plot, but at times used confusing language or omitted important points. A rating of 4 was to be given to compositions that were organized and had a well-developed plot or theme, communicated effectively and clearly, and concluded logically.

In addition to the qualities described for a rating of 4, if the communication was especially clear or clever and showed originality or depth of plot and character development, the story would receive a rating of 5.

By the end of the training session, raters could reach an acceptable level of agreement with only one rating point apart.

Prior to marking, all compositions had been printed on the computer with names omitted so that the raters did not know who had written the story and whether it was composed on a word processor or with pen and paper. This eliminated the bias against sloppy handwriting, but all phrasing, spacing , and errors were kept in tact when transferring the handwritten stories to computer.

If there were any essays rated with a difference of more than one point , the papers would be judged by a third rater.

The results were analyzed by t-test.

B.Quantity

PC-Write was used to count the number of words of each essay. T-test would be used to test if any significant difference was found between the computer group and pen group.

C. Attitude

How is the questionnaire constructed?
In most questionnaires on attitude towards writing (Beesley 1986, Grizinki 1986, Baer 1983), the designs were mainly focused on the emotion . This design is somehow dangerous because a subject may have ability to do something but may not like to do it.

According to Osgood (Nunally,1967,p.537), although the factors in the attitude survey vary in different studies, basically 3 factors share in common. They are the potency, activities and emotions.

In order to have a comprehensive view on the subjects' attitude towards writing, a survey on the 3 categories are developed.

Table 2 goes here.
(see Appendix 2.)

In Section I , it is on potency, Section II is on activities. Section III is on emotion side. The subjects had to pick from 1 to 5. 1 means never, 2 means sometimes,. 3 means about half of the time. 4 means most of the time ,5 means always.

Subjects had to do this test before and after the experiment. T-test was employed to analyze.

VI. Findings

A. Quality

Altogether each subject had to write 10 essays. Only 395 essays were collected. Pen group wrote 196 essays while computer group wrote 197 essays.

In comparing the overall result , there was significant difference in which $t(386.77)=4.26$ $p < 0.000$. Computer group scored significantly higher than pen group at 0.01 level.

Table 3
Overall result of quality rating
between computer group and pen group

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	196	2.9082	.636	.045
Computer	197	3.1980	.710	.051

Pooled Variance Estimate				Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
1.25	.125	-4.26	391	.000	-4.26	386.77	.000*

*-significantly different at 0.01 level.

When the results were analyzed essay by essay, only Essay No. 8 and No. 9 had significant differences.

Table 4
Quality rating from Essay No1 to No.10

Essay No	N (no of essays)	t-value	DF	2-tail prob
1	40	-0.43	32.67	0.668
2	40	-1.14	37.87	0.261
3	39	-1.73	39.96	0.920
4	39	-0.93	36.30	0.356
5	39	-0.47	36.92	0.638
6	40	-1.25	32.54	0.221
7	40	-1.72	35.94	0.093
8	40	-4.32	34.06	0.000*
9	39	-2.53	31.10	0.017*
10	38	-1.20	28.33	0.239

*-significantly different at .05 level.

Table 5 indicated that computer group had a higher rating than pen group, t(34.06)=-4.32 p <.01 .

Table 5
Comparison on quality rating
between computer group and pen group on Essay No.8

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	20	2.7000	.594	.133
Computer	20	3.4000	.417	.093

	Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.03	.132	-4.32	38	.000	-4.32	34.06	.000*

*significantly different at p .01 level.

Table 6 shows that computer group had a higher mean than the computer group by holistic rating at .05 level.

Table 6
Comparison of quality rating
between computer and pen group on Essay No.9

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	20	3.1000	.384	.086
Computer	19	3.5000	.577	.132

	Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.26	.086	-2.56	37	.015	-2.53	31.10	.017*

*significantly different at .05 level.

Result: Hypotheses 1 is established that subjects using computer can write better quality essays than those who use pen.

B. Quantity

The overall result indicated that the pen subjects wrote 127 words while the computer group wrote 136 words. Table 7 shows that significant difference is found that computer group can write more than the pen group ,$t(273.54)=-2.06$ $p<0.04$.

Table 7
Overall result on quantity
between computer group and pen group

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	196	127.0306	27.219	1.944
Computer	197	136.7360	60.066	4.279

	Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
4.87	.000	-2.06	391	.040	-2.06	273.54	.040*

*significant at level $p < 0.05$.

However ,when the results were broken down ,Table 8 shows that only Essay No.7, No. 8 and No. 9 bore significant difference in terms of the no of words.

Table 8
Quantity comparison from Essay No1 to No.10

Essay	N	t-value	Df	2-tail prob
1	40	-0.89	19.43	0.384
2	40	-0.63	36.02	0.530
3	39	1.61	36.57	0.116
4	39	-0.71	36.31	0.480
5	39	-0.49	36.69	0.625
6	40	0.18	33.51	0.862
7	40	-2.34	36.0	0.025*
8	40	-3.78	32.58	0.001*
9	39	-2.80	21.91	0.010*
10	38	-0.68	35.09	0.498

*-significantly different at 0.05 level.

Table 9 indicates that the computer group scored a higher means of word when comparing with the means of pen group. at p < .01 level.

Table 9
Comparison on no of words
between computer group and pen group on Essay No.8

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	20	114.7500	12.464	2.787
Computer	20	134.1000	19.219	4.297

	Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
2.38	.066	-3.78	38	.001	-3.78	32.58	.001*

*-significantly different at .01 level.

Table 10 indicates pen group did not write as many words as the computer groups did at .05 level.

Table 10
Comparison of no of words
between computer group and pen group on Essay No.9

	Number of Cases	Mean	Standard Deviation	Standard Error
Pen	20	116.1500	12.339	2.759
Computer	19	140.7368	36.338	8.336

	Pooled Variance Estimate			Separate Variance Estimate		
F Value	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.	t Value	Degrees of Freedom	2-Tail Prob.
8.67	.000	-2.86	37	.007	-2.80	21.91	.010*

*significantly different at .05 level

Result : Hypothesis 2 is established that subjects using computer can write more than those who use pen.

C.Attitude

Subjects had to do the questionnaire before and after the experiment. T-test was employed to analyze. We will look at the overall result , then by groups .

1. Overall result

Significant difference was found with $t(39)=-6.51$ $p<.000$ The difference was very marked that the p value was at .000 level which was even smaller than 0.01.

It indicates that the students had significant changes after the experiment.

Table 11
Overall results of attitude change
before and after the experiment

Variable	Number of Cases	Mean	Standard Deviation	Standard Error
BEFORE	40	60.0750	8.603	1.360
AFTER	40	66.4250	8.658	1.369

(Difference) Mean	Standard Deviation	Standard Error	2-Tail Corr.	Prob.	t Value	Degrees of Freedom	2-Tail Prob.
-6.3500	6.167	.975	.745	.000	-6.51	39	.000*

*-significantly different at .01 level

2. Groups on overall, computer and pen

There are altogether 21 questions in this questionnaire. It is divided in to 3 sections ,see Appendix 1. Section 1 is Potency with 8 questions while there are 8 questions in Section II on writing activities. In the last section, the 5 questions are all on emotions.

The 3 groups of questions were analyzed according to all subjects, then by computer group and pen groups.

Table 12
A breakdown of result by overall and groups on attitude

	Overall n=40		Pen n=20		Computer n=20	
	t	p	t	p	t	p
Potency (Q1-8)	-3.70	0.001 *	-2.48	0.023*	-2.76	0.013 *
Activities (Q9-15)	-5.42	0.000*	-4.12	0.001*	-3.53	0.002*
Emotions (Q16-21)	-1.11	0.272	-1.68	0.109	-0.13	0.896

* - Significant different at p <0.05.

a. On an overall basis, there are significant difference for Potency group and Activities group with significant level even lower than p < 0.01.It means that after treatment, all subjects underwent drastic changes when they viewed their abilities to write and the activities they did during writing. However, on Emotions , no significant difference was found .

b. Comparing pen group and computer group, the significant difference of computer group (p<0.013) on Potency was higher than pen group (p < 0.023). The picture was just the reverse while computer group was compared with pen group on Activities in which the pen group got a higher significant level at p < 0.001 when computer group has got t(19)=-3.53 p <0.002.

On Emotions, no significant different was found on an overall basis and for both groups.

Summary-There were changes on Potency for overall group, computer and pen groups. While on activities, the significant difference was consistently found across all groups. Consistency remained the same on Emotions with no significant difference across all groups.

One interesting point is that Question No.7 indicated subjects had significant change on ' Writing Chinese compositions is easy for me' at p<.0000 but when the subjects answered Question 18 'I like to write Chinese Compositions' , no significant difference was found (p <.075).

That means although the subjects opined that writing Chinese compositions was easy for them, it did not necessarily follow they liked it. In other words, potency and emotion scoring may not be consistent.

However, one thing which is very consistent is that subjects undergo no significant difference on Question 17 'Writing English Composition is easy for me '($p < 1.0$) and 'Question 1 'I enjoy writing English Compositions ' ($p < 0.623$). Despite the subjects had practised more with 4 more extra essays, they still found writing English composition was not easy to them and they did not enjoy writing it.

VII.Conclusion

The hypotheses that computer subjects can write better, longer essays are established. All subjects experienced significant changes on Potency and Activities towards writing although there was no significant change on emotions.

There might be several factors attributing why the computer group can write better and longer. The first one is they used a user-friendly wordprocessing software with a big memory of speller-checker. Also they were allowed to revise more at the specified lunch and after school hours instead of just writing their essays in the class only. Besides, pre-writing activity was done in which other researchers such as Beesley, Grizinki had not done so.

Since this study is pioneer of its kind and the number of subjects involved was only 40, its findings might need to be validated by other researchers who are interested in ESLs writing with computer.

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Appendix 1

Rating Scale

1 2 3 4 5
Lowest Highest

1.Does not communicate effectively. Has no underlying theme or plot. Difficult to understand. Sentences are unrelated.

2.Attempts are made to convey a theme but writing is still unorganized and hard to follow. Ideas are stated but not explained. Thoughts and storylines are often left dangling with no conclusion.

3.Conveys a theme or plot, but at times uses confusing language or omits important points. Has a conclusion, but it may not fit with the rest of the information presented.

4.Is organized and has well-developed plot or theme. Communicates effectively and clearly. Story is concluded logically.

5.In addition to #4, the communication is especially clear ,shows depth of plot and character development. The whole theme can be conveyed clearly. There is beginning , middle and an end.

Appendix 2

SURVEY ON ATTITUDE TOWARD WRITING

Answer the following questions by circling the number.

1	2	3	4	5
Never	Sometimes	About	Most of the time	always

Section I (Potency)

1. Writing English Compositions is easy for me.
   1 2 3 4 5

2. Expressing words and ideas in English is easy for me.
   1 2 3 4 5

3. I am good at grammar.
   1 2 3 4 5

4. I think a good writer must know vocabulary and grammar well.
   1 2 3 4 5

5. There are many words that I know their sound but not sure of their spellings.
   1 2 3 4 5

6. My handwriting is clean and tidy.
   1 2 3 4 5

7. Writing Chinese Compositions is easy for me.
   1 2 3 4 5

8. I am good at spellings.
   1 2 3 4 5

Section II(Activities)

9. I have an outline of the compostion before I write.
   1 2 3 4 5

10. I revise my compositions.
    1 2 3 4 5

11. When I do not know how to say a word or sentence in English, I ask my classmates.
    1 2 3 4 5

12. When I do not know how to say a word or sentence in English, I ask my teacher.
    1 2 3 4 5

13. When I do not know how to say a word or sentence in English , I use a dictionary.
    1 2 3 4 5

14. I reread and review my English Compositions before giving them to the teacher.

1 2 3 4 5

15. I revise my composition by changing words.

1 2 3 4 5

16. I revise my composition by changing word order.

1 2 3 4 5

<u>Section III</u> (emotions)

17. I enjoy writing English Compositions.

1 2 3 4 5

18. I like to write Chinese Compositions.

1 2 3 4 5

19. I enjoy rereading and making changes in my English Compositions.

1 2 3 4 5

20. I like to have guided compositions.

1 2 3 4 5

21. I like to write without guided by the teacher.

1 2 3 4 5